Collaboration for impact in global health

Many medical research institutes and funders consider only corresponding, first, second, or last authorship as relevant contributions to academic endeavours.[1] This necessity potentially increases competition, discourages collaboration, and can lead to secrecy around ideas.[2] There is also enormous pressure upon academics to do high impact research, which, rightly or not,[3] is judged by the number of citations the article receives or by the impact factor of the publishing journal. The relation between collaboration and impact is well established in other fields,[4] but less so in medical research. We therefore explored the effect of collaboration on impact for three fields of relevance to global health research: HIV, diabetes, and health systems research.

We searched Scopus using the title terms "HIV" or "human immunodeficiency virus"; "health system" or "healthcare system" or "health service"; and "diabetes" for all research published in 2012. This year was chosen to allow a 5 year period to elapse before analysis, and over which time articles would accrue citations. We excluded articles with the type-descriptor "review" and all non-human animal research. We randomly selected, using the random data point selection function of SPSS, 1500 of the resultant 25 010 publications and manually assessed them to ensure inclusion criteria were met. We then used generalised linear models to ascertain the association between collaboration (defined as the number of authors, authors' institutes, or their countries) and impact (defined as numbers of citations over the 5-year period after publication or the impact factor of the publishing journal). Numbers of citations were extracted from Scopus and journal impact factor was extracted from Web of Science. If Web of Science had no data on impact factor for a journal, we assigned that journal a value of 0.

Measures of impact were skewed, with large numbers of zero datapoints, and predictor variables were also non-normally distributed. To assess the predictive value of variables, we therefore divided the number of authors and institutes into quintiles, the number of countries into tertiles, and applied generalised linear models using a Tweedie distribution (see appendix for further detail). Study type (basic science *vs* later-stage clinical) was a co-variable.

We assessed 1380 articles in total after manual checking (see appendix for characteristics). We found that all measures of collaboration were positively associated with impact on univariable testing (figure; appendix). However, on multivariable testing, the number of countries was no longer an independent predictor of impact factor (appendix). Estimated marginal means showing the magnitude of the associations are presented in the appendix. We also found that the associations between number of institutes or countries and markers of impact remained significant after adjusting for number of authors, suggesting that the findings are unlikely to be driven by self-citation (appendix).

Our study has some limitations. For example, we only assessed three categories of research and our findings cannot be taken to be representative of all medical research fields. Also, we did not take self-citations into account; however, impact factor of the publishing journal should not be affected by self-citations. Finally, we chose the number of citations and impact factor of publishing journal as being our markers of impact, and these variables may not capture the impact that research has in real-world settings. Other measures of impact, such as number of manuscript reads, shares on social media, or other media impact may have more applicability to real-world impact. However, we chose to use measures of impact that academics currently value.

Our findings should reassure those wishing to embark on collaborative global health research that this path will lead to greater impact. Nevertheless, the field of medical research also has to move away from valuing only certain author positions. Publications in the fields of physics and economics list authors alphabetically, with contributor statements reflecting authors' roles. There also needs to be more credit given to researchers who collaborate, for example by use of the S-index, which has been suggested for data sharing.[5]

See Online for appendix

Finally, we strongly encourage academic institutes and research funders to move away from using traditional measures of impact to

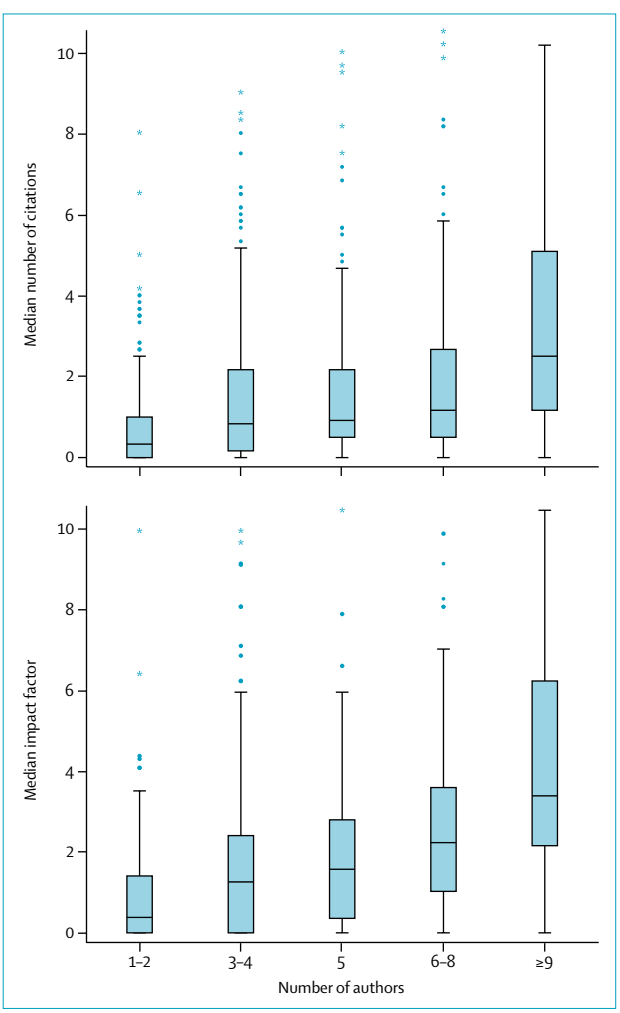

Figure: **Number of cites (top) and impact factor of journal (bottom) by quintile of authors**

judge research utility and instead take an approach that considers the impact that the research has for its ultimate users—patients and populations in need, wherever in the world they may live.

The authors are listed alphabetically. YW was an employee of Elsevier when this study was done. The other authors declare no competing interests.

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